

REMARKS

By the present amendment, claims 1 and 8 have been amended to recite that the depollution assembly comprises a catalyst and a particle filter, the heat exchanger being placed in said exhaust system downstream from the depollution assembly in the exhaust gas flow direction, and the exhaust system comprises a bypass duct in parallel with the heat exchanger.

Support for the added recitation is found in the original application, for example, at least page 3, lines 16-19.

Also, claim 1 has been rewritten with active verbs and separate paragraphs introduced by the transition “comprising” to improve the presentation of the method steps, as well as the active acts of circulating a cooling fluid in the circuit and directing the exhaust gas in the exhaust system. Also, the phase “towards said heat exchanger or towards a bypass duct” has been replaced by “towards at least one of (i) the heat exchanger and (ii) the bypass duct” in claim 1 for improved presentation. Similarly, claim 8 has been amended with separate paragraphs following a single transition “comprising,” and to remove the expressions “of the type” and “by control means.”

Claims 5 and 7 have been corrected and amended to remove the phrases introduced by “preferably,” claim 8 has been presented with separate paragraphs, and claims 13 and 14 have been added for corresponding recitations.

Claims 1-14 are pending in the present application. Claims 1 and 8 are the only independent claims.

I. Objection to the specification

In the Office Action, the specification is objected to for typographical matters, and correction of the paragraph at page 5, lines 20-26 is requested with respect to Fig. 2.

The specification has been amended as requested in the Office Action. Accordingly, it is submitted that the objections should be withdrawn.

II. Objection to the claims

In the Office Action, claim 5 is objected to similarly to the specification at page 5, lines 20-26, and claim 1 is objected to as lacking a transition “consisting of” or “comprising” between a preamble and a body.

Claim 1 has been rewritten with active verbs and separate paragraphs introduced by the transition “comprising” to improve the presentation of the method steps, including a recitation that the exhaust comprises a bypass duct in parallel with the heat exchanger, as well as the active act of circulating a cooling fluid in the circuit. Also, the phrase “towards said heat exchanger or towards a bypass duct” has been replaced by “towards at least one of (i) the heat exchanger and (ii) the bypass duct” in claim 1 for improved presentation.

Similarly, claim 8 has been amended with separate paragraphs following a transition “comprising,” and to remove the expressions “of the type” and “by control means.”

Claim 5 has been corrected as in the specification.

In view of the above, it is submitted that the objections should be withdrawn.

III. Indefiniteness rejection of claims 5 and 7

In the Office Action, claims 5 and 7 are rejected under 35 U.S.C. 112, second paragraph, as indefinite similarly to the objection to the specification at page 5, lines 20-26, and in relation to the phrases introduced by “preferably.”

The phrases introduced by “preferably” have been deleted from claims 5 and 7 and introduced in new claims 13 and 14. Accordingly, it is submitted that the rejection should be withdrawn.

IV. Art rejections

In the Office Action, claims 1, 3, 5, 7, 8, 11, and 12 are rejected under 35 U.S.C. 103(a) as obvious over EP 0985807A1 (“EP’807”) in view of U.S. 4,335,849 to Van Bashuysen (“Van Bashuysen”).

Further, claims 2, 4, and 6 are rejected under 35 U.S.C. 103(a) as obvious over EP’807 in view of Van Bashuysen, further in view of US2003/0136113A1 to Nakagawa et al. (“Nakagawa”).

Also, claim 9 is rejected under 35 U.S.C. 103(a) as obvious over EP’807 in view of Van Bashuysen, further in view of US 2001/0013409A1 to Burk et al. (“Burk”).

Claim 10 is 35 U.S.C. 103(a) as obvious over EP’807 in view of Van Bashuysen, further in view of Burk and Nakagawa.

Reconsideration and withdrawal of the rejections is respectfully requested.

The system of EP'807 is complex with a heat exchanger upstream of a main catalyst 7 and a pre-catalyst 4 upstream of the heat exchanger. Additionally, each of the catalyst and pre-catalyst is equipped with an electric heating device.

More precisely, the heat exchanger of EP'807 is placed upstream of the main catalyst in order to reduce the temperature of the exhaust gases when they are too hot. However, this placement of the heat exchanger is detrimental for initiating the main catalyst, in particular when the engine is started cold, or in a cold environment. This is why the system of EP'807 requires an initiation catalyst upstream of the exchanger, and also electric heaters upstream of each of the catalysts.

Additionally, EP'807 is silent regarding where a particle filter would be placed in the system of EP'807. However, since a particle filter is usually disposed downstream of the main catalyst in order to benefit from the temperature surges from the catalyst, even if, arguendo, a person of the art attempted to add a particle filter in the system of EP'807, that person would incorporate the particle filter downstream of the main catalyst, i.e., the heat exchanger would be upstream of the particle filter. As a result, the heat exchanger of EP'807 (1) would not benefit from temperature surges of the main catalyst and the particle filter, and (2) would be subjected to be deteriorated by soot coming from the engine, which have not yet been collected by a particle filter.

In summary, the system of EP'807 is apparently designed to derive heat to the cabin compartment when the exhaust is too hot, but this creates drawbacks for initiation of the catalyst in situations such as when the engine is cold, and for protection of the heat exchanger from soot.

In contrast, in the presently claimed invention, the heat exchanger is placed in said exhaust system downstream from the depollution assembly in the exhaust gas flow direction, wherein the depollution assembly comprises a catalyst and a particle filter, as recited in present claims 1 and 8.

An advantage of the presently claimed invention is that the heat exchanger does not remove heat from the exhaust upstream of the depollution assembly in situations where the depollution assembly may be difficult to initiate, such as when the environment is cold.

A further advantage is that the operation of both the depollution assembly and the heat exchanger can be improved, in particular in that (i) the depollution assembly can reach initiation temperature more quickly and (ii) the exothermic effect of the depollution assembly can be captured to increase the heat transfer to heat the passenger compartment, as described in the present specification, for example, page 4, lines 21-35 and page 7, lines 13-22.

Thus, the pre-catalyst and electric heaters of EP'807 can be used more efficiently, or could be dimensioned so as to be smaller and consume less power, or could be omitted altogether.

Also, the heat exchanger being disposed downstream of the particle filter, it is clear that the problem of deterioration by soots can be avoided or at least reduced.

This feature of the presently claimed invention and its advantages are not taught or suggested in EP'807, and the other cited references fail to remedy this deficiency. Therefore, the present claims are not anticipated by EP'807, and not obvious over EP'807 taken alone or in any combination with the other cited references.

In addition, with respect to the dependent claims, it is submitted that the combined features of each of these respective claims are not taught or suggested in the cited references taken alone or in any combination.

In particular, with respect to each of claims 2 and 10, it is submitted that the injection of additional quantity of fuel as recited in present claims 2 and 10 makes it possible to improve the exothermic effect at the depollution assembly, which further improves the heat transfer at the heat exchanger located downstream of the depollution assembly. This effect would not be expected in the system of EP'807, where only a pre-catalyst is arranged upstream of the heat exchanger, whereas the main catalyst is located downstream of the heat exchanger. More precisely, in the presently claimed invention, the additional injection of fuel has the double effects of (i) increasing the temperature of the exhaust gases at the outlet of the engine, and (ii) increasing the amount of unburned HC at the inlet of the depollution assembly, which results in an exothermic oxidation reaction in the depollution assembly (for example, usually with the main catalyst) to further increase the temperature of the exhaust gases at the inlet of the exchanger. This additional injection of fuel is optimally used to transfer energy to the heat exchanger since the heat exchanger is downstream of the depollution assembly, as described in the present specification, for example, page 4, lines 21-35.

The combined features of each of the dependent claims, and in particular the combined features of each of claims 2 and 10, are not taught or suggested in any of the cited references. Therefore, each of these respective claims is not obvious over the cited references taken alone or in any combination.

Amendment
US Appl. No. **10/553,886**
Attorney Docket No. **PSA0305071**

In view of the above, it is submitted that the rejections should be withdrawn.

Conclusion

In conclusion, the invention as presently claimed is patentable. It is believed that the claims are in allowable condition and a notice to that effect is earnestly requested.

In the event there is, in the Examiner's opinion, any outstanding issue and such issue may be resolved by means of a telephone interview, the Examiner is respectfully requested to contact the undersigned attorney at the telephone number listed below.

In the event this paper is not considered to be timely filed, the Applicants hereby petition for an appropriate extension of the response period. Please charge the fee for such extension and any other fees which may be required to our Deposit Account No. 502759.

Respectfully submitted,

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